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AUTHOR Reder, Stephen
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ABSTRACT

A considerable body of evidence indicates that using technology simply to expand traditional adult literacy approaches and programs will not likely meet existing literacy needs, let alone the heightened expectations of the national literacy goal. One promising approach is to use home-based personal computers (PCs) equipped with modems and appropriate software to build and participate in on-line communities of linked computer users involved in literacy development efforts. Technology can play a useful role in building literacy engagement in the following ways: engaging learners in literacy activities, removing/reducing logistical barriers to participation, grounding participation in positively valued meanings and activities, addressing concerns of anonymity and "face," serving as a bridge (by using interactive texts and personalizing academic activities), establishing continuities between helping and tutoring, and building learning communities. Included among the important design and implementation issues associated with the approach of using home-based PCs to form an adult literacy education network are the following: ample equipment and access, technical support for equipment installation and use, user-friendly software design and tools, and teaching and learning support. (MN)

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ON-LINE LITERACY DEVELOPMENT: A CONTEXT FOR TECHNOLOGY IN ADULT LITERACY EDUCATION

Stephen Reder
Northwest Regional Educational Laboratory

Contractor Report

Adult Literacy and New Technologies: Tools for a Lifetime

April 1992

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ON-LINE LITERACY DEVELOPMENT: A CONTEXT FOR TECHNOLOGY IN ADULT LITERACY EDUCATION

In the last few years, there has been an increasing recognition and discussion of the need for a more literate adult population in the United States. A variety of forces--changing demographics, increasing international economic competition, rapid technological changes--are driving these calls for increased adult literacy. Universal adult literacy has now been officially established as a national goal for education,[1] an historically unprecedented expectation.[2] New private and public initiatives are materializing to improve the capacity and quality of both traditional programs (e.g., adult basic education) as well as specialized programs to serve adults in particular social and economic situations (e.g., welfare reform, family literacy and workplace literacy programs). This deluge of policy, legislative and fiscal initiatives is stimulating research and development efforts which are targeting expansion of the nation's service capacity for adult literacy education.[3]

Among the vital research and development issues, of course, are ones pertaining to the use of technology, particularly computer and telecommunications technologies. Many adult educators have suggested that technology can play a significant role in expanding and even possibly transforming adult literacy education.[4] There are several reasons to be optimistic about the potential contributions technology can make to these educational endeavors. First, as the Office of Technology Assessment (OTA) has convincingly demonstrated in its

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[1] U.S. Department of Education, National Goals for Education (Washington, DC: U.S. Department of Education, 1990).

[2] Daniel P. Resnick and Lauren B. Resnick, "The Nature of Literacy: An Historical Exploration," Harvard Educational Review, vol. 47, pp. 370-85, 1977. George Armitage Miller, The Challenge of Universal Literacy, Science, vol. 241, pp. 1293-1298, 1988.

[3] U.S. Department of Education, Summary Report. National Forums on the Adult Education Delivery System (Washington, DC: Office of Vocational and Adult Education, 1991).

[4] Technology and Adult Education: Special Issue, Lifelong Learning, vol. 11, no. 8, 1988. Terilyn Turner and Stacey H. Stockdill (eds.) The Technology for Literacy Project Evaluation (St. Paul, MN: The Saint Paul Foundation, 1987). Antonia Stone, Keystrokes to Literacy: Using Computers As Learning Tools for Adult Beginning Readers (Lincolnwood, IL: National Textbook, 1991).

earlier assessments, educational technology can have profound impact on children's learning[5]--so why not on adults' learning, too? Second, technology is already playing a large and growing role in the general training of adult workers.[6] Third, a variety of new technology-based adult literacy programs and products are being developed and experimented with.[7] Evaluations of such efforts are encouraging,[8] suggesting that computer-based technology can assist some adults and teachers engaged in the process of literacy development.

Within the realm of adult literacy education, however, most discussion of and experimentation with the use of technology has been based on a framework of expanding and/or improving existing types of instructional activities. In this conception, technology is seen as a tool to make existing programs more efficient or more extensive: to help serve more students with fewer teachers; to diversify the times and locations at which students can participate; to improve the management of program resources; to facilitate the matching and tracking of students and tutors; and so on. Valuable and useful as such applications may well be, little serious attention has yet been given to articulating and experimenting with a wider array of potential roles for technology in adult literacy development.

There are two reasons why this paper will therefore focus on a new approach to using technology to amplify adult literacy development in the United States. First, there is considerable evidence that the mere expansion of traditional approaches and programs--regardless of whether technology is used--will not likely

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[5] U.S. Congress, Office of Technology Assessment, Power On! New Tools for Teaching and Learning, OTA-SET-379 (Washington, DC: U.S. Government Printing Office, September 1988). U.S. Congress, Office of Technology Assessment, Linking for Learning: A New Course for Education (Washington, DC: U.S. Government Printing Office, November 1989).

[6] U.S. Congress, Office of Technology Assessment, Worker Training: Competing in the New International Economy (Washington, DC: U.S. Government Printing Office, September 1990).

[7] Stone, op. cit., footnote 4. Terilyn C. Turner, An Overview of Computers in Adult Literacy Programs, Lifelong Learning, vol. 11, no. 3, pp. 9-12.

[8] Turner and Stockdill, op. cit., footnote 4.

meet existing needs let alone the heightened expectations of the national goal.[9] Second, the computer and training industries are already well underway with refining and adapting existing approaches and technologies to adult literacy instruction, judging from the quickly growing array of new products for the adult market.[10] This paper will therefore propose a promising new technology-based approach to adult literacy development, based on some recent literacy research as well as on promising use of the approach with children's literacy development and in the literacy activities of relatively well-educated adults.

The approach suggested is to use home-based PCs equipped with modems and appropriate software for building and participating in on-line communities of linked computer users. Given appropriate access to such technology, support and encouragement in its use, and a network of compatible co-learners, many adults may begin to use literacy (electronic text in this case) for communicating and sharing information, concerns and activities. Although this approach is, to be sure, only one of the many possible options for applying computer technology to adult literacy services, it is one which has an excellent chance of engaging many adults in literacy development who might not otherwise participate.

The remainder of the paper is accordingly organized into four topics: (1) *why* new kinds of approaches and programs are needed in adult literacy (as opposed to approaches which seek only to expand and improve traditional programs); (2) description of the new technology-based strategy; (3) rationale for why the proposed strategy will impact adult literacy (based on the research literature); and (4)

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[9] Brian V. Street, "Literacy and Social Change: The Significance of Social Context in the Development of Literacy Programmes," In Daniel Wagner (ed.), The Future of Literacy, (Oxford: Pergamon Press, 1987). Elsa Roberts Auerbach, Toward a Social Contextual Approach to Family Literacy, Harvard Educational Review, vol. 59, no. 2, 1989, pp 165-181. Francis E. Kazemek, Adult Literacy Education: Heading into the 1990s, Adult Education Quarterly, vol. 41, no. 1, 1990, pp. 53-62. David Harman, Illiteracy: A National Dilemma, (New York: Cambridge University Press, 1987). Thomas G. Sticht, Adult Literacy Education, in E. Rothkopf (ed.), Review of Research in Education, vol. 15, 1988, pp. 59-96. Hannah Arlene Fingeret, "Meaning, Experience and Literacy," Adult Basic Education, vol. 1, no. 1, 1991, pp. 4-11.

[10] Eunice N. Askov and Cindy Jo Clark, Index of Workplace & Adult Basic Skills Software (PA: Pennsylvania State University, University Park Institute for the Study of Adult Literacy, 1989).

practical issues in designing and implementing these new types of technology-based adult literacy programs with this approach.

NEED FOR NEW APPROACHES IN ADULT LITERACY EDUCATION

Adult educators and adult education researchers have questioned whether the mere expansion of existing approaches and programs can meet existing needs let alone the heightened expectations of the national goal.[11] There are both practical reasons (based on the experience of programs) and theoretical reasons (gathered from research on literacy development) to question whether the extant array of institutional arrangements and programmatic approaches can be harnessed effectively to meet these needs. Looking at the experience of various types of programs which provide adult literacy education, two major issues come to the fore. First, participation rates in established adult literacy programs are very low. The National Governors' Association, for example, estimates that only 5% of the target population is served by existing programs.[12] Second, of those who do come, very few stay in the programs for sufficiently long periods of time to achieve significant learning gains. Many barriers are encountered in participating in these literacy programs, some of which are *logistical* (e.g., lack of child care or transportation), and some of which are *conflictual*, that is, involve a poor fit between the goals and values of program providers and those of potential participants.[13] One well-known study, for example, surveyed individuals who were eligible to participate in programs

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[11] Street, op. cit., footnote 9. Auerbach, op. cit., footnote 9. Kazemek, op. cit., footnote 9. Harman, op. cit., footnote 9. Sticht, op. cit., footnote 9. Fingeret, op. cit., footnote 9.

[12] U.S. Department of Education, Summary Report: National Forums on the Adult Education Delivery System (Washington, DC: Office of Vocational and Adult Education, 1991).

[13] Stephen Reder and Karen Reed Green, Giving Literacy Away: An Alternative Strategy for Increasing Adult Literacy Development, commissioned monograph prepared for National Adult Literacy Project, (ERIC Document Reproduction Service No. ED 253 775, 1985). Street, op. cit., footnote 9.

but were not participating. Survey results indicated that most eligible non-participants would not participate even if logistical barriers were eliminated; these individuals, termed program *resisters*, reported conflict between their own personal goals and those of the literacy programs.[14]

Such conflictual barriers are frequently cross-cultural in nature: Members of ethnolinguistic minority groups, already overrepresented in the target population, are consequently underserved by literacy programs. Even the national initiatives for "family literacy" and "workplace literacy" programs have been characterized as attempting to impose a narrow set of values ands norms as they pertain to the family[15] and to the workplace.[16]

Although the evolutionary improvement and expansion of current programs could, in principle, remove or at least reduce the logistical barriers to sustained participation, conflicts of values and goals cannot be so readily overcome without radical changes in the very nature of adult literacy programs.[17] A growing body of research suggests that literacy programs will be most effective when they "situate" instruction within the activities, values and lives of their individual learners.[18] In many cases, such instruction may need to be rather *informal* (as are some literacy tutoring programs) relative to formal adult developmental education programs. The term *giving literacy away* was coined some years ago to describe the strategy of

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14 Hal Beder, Reaching ABE Students: Lessons from the Iowa Studies, Adult Literacy and Basic Education, vol. 14, no. 1, 1990, pp. 78-94.

15 Auerbach, op. cit., footnote 9.

16 Sheryl Gowen, "Eyes on a Different Prize": A Critical Ethnography of a Workplace Literacy Program, University Microfilms International Order No. 9102992, (Ann Arbor, MI: Dissertation Information Service, University Microfilms International, 1990).

17 Harman, op. cit., footnote 9. Auerbach, op. cit., footnote 9. Kazemek, op. cit., footnote 9. Reder and Green, op. cit., footnote 13. Arlene Fingeret and Paul Jurmo, Participatory Literacy Education. New Directions in Continuing Education, (San Francisco, CA: Jossey-Bass Inc., Publishers, 1989). Susan L. Lytle and Marcie Wolfe, Adult Literacy Education: Program Evaluation and Learner Assessment, (Columbus, OH: ERIC Clearinghouse on Adult, Career and Vocational Education, 1989).

18 Reder and Green, op. cit., footnote 13. Roland Tharp and Ronald Gallimore, Rousing Minds to Life: Teaching, Learning and Schooling in Social Context, (Cambridge: Cambridge University Press, 1988). Street, 1986. Fingeret, op. cit, footnote 9.

situating literacy education within the logistic and cultural contexts of learners' everyday activities rather than within school-like institutional contexts.[19] Although some promising steps have been taken by community-based programs,[20] for example, in the direction of giving literacy away, even greater innovation may be needed to design new ways to promote adult literacy development.

The tension between these two programmatic paths towards adult literacy development--expand and improve existing types of programs versus innovate new approaches--is rooted in the recurrent tension between viewing literacy as a vehicle to meet the expectations of the wider society or as a means of responding to diverse personal, community and cultural demands and goals. It is suggested here that a technology-based strategy be used to develop new types of programs. It is envisioned that these new programs will complement and possibly articulate with existing programs rather than replace them. But it is critical that they be implemented independently of existing efforts if they are to truly reach and serve the broad range of those in need. [21]

A TECHNOLOGY-BASED STRATEGY FOR CONSTRUCTING NEW PROGRAMS

There have been numerous visions of harnessing telecommunications and computer technologies to seamlessly link all the households, workplaces, agencies and learning environments in the United States.[22] In most flavors of this vision, sophisticated users (possibly with "intelligent" help from the computers themselves) are able to search efficiently for and access needed information from a wide variety

19 Reder and Green, op. cit., footnote 13.

20 Antonia Stone, op. cit., footnote 4. Association for Community-Based Education, ACBE Evaluations of Community-Based Literacy Programs, (Washington, DC: Association for Community-Based Education, 1989).

21 Fingeret, op. cit., footnote 9.

22 Starr Roxanne Hiltz and Murray Turoff, 1978, Networked Nation: Human Communication Via Computer, (Reading, MA: Addesen-Wesley, 1978).

of remote data bases. They are also able to locate, communicate and collaborate with a range of similarly interested individuals for sharing knowledge, tapping specialized expertise, and building and participating in "on-line" communities around common interests, concerns and goals.

There are numerous examples of the use of such systems, combining electronic mail, bulletin boards and other text and/or graphics capabilities, to create exciting and effective learning environments for schoolchildren.[23] And the use of such remote computer-mediated communications is well established and highly effective--at least among relatively educated and literate adults--for purposes of information- sharing, decision-making, project collaboration and even distance education and training.[24] But there have been few serious attempts to use such technology and remote connections as a teaching, learning and communication environment for less educated adults. There is, nevertheless, ample reason to be optimistic about the utility of such technologies for adult literacy development.

First, in cases where computers have been used to deliver adult literacy instruction, evaluations have suggested that at least some adults learn and enjoy learning with that instructional technology.[25] Second, there are anecdotal reports about parents who have marginal literacy capabilities participating in telecommunications networks that support their children's learning activities. In one experiment, participating students' homes are equipped with PCs and modems for accessing a central system on which electronic mail, bulletin boards and other customized text-based activities comprise a teaching and learning environment for

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[23] Jan Hawkins, Technology Mediated Communities for Learning: Designs and Consequences, The Annals of the American Academy of Political and Social Science, vol. 514, March 1991, pp. 159-174. U.S. Congress, Office of Technology Assessmen., op. cit, footnote 5. Dennis Newman, Peg Griffin, and Michael Cole, The Construction Zone: Working for Cognitive Change in School, (Cambridge: Cambridge University Press, 1989).

[24] Lee S. Sproull and Sara Kiesler, Computers, Networks and Work, Scientific American, vol. 265, no. 3, pp. 116-127, September 1991.

[25] Stone, op. cit., footnote 20. Turner, op. cit., footnote 4. Sticht, op. cit., footnote 9.

the elementary students and their teachers. Although parent utilization of the "system" is voluntary, many parents are participating on-line and experimenting with the capabilities of the system and communicating with teachers and other parents.[26] These reports, anecdotal as they are at this point, suggest it is feasible (given convenient access to the equipment and technical assistance in setting up and using it) for parents and other adults who have poor literacy skills to use telecommunication systems for text-based communication and information sharing, and presumably, for literacy development.

To make this vision more concrete, let's imagine how a variety of adults might use such systems as learning environments for literacy development. Although these sketches are fictional, they are not unlikely representations of how such an approach to using technology for adult literacy development might operate.

> Bill, a 46-year-old automobile worker, lost his job when his company trimmed back hundreds of jobs at the local plant. He's afraid his job may never be restored. Like many of his high school friends, he says he was never a "paper and pencil type", and his reading and writing skills are weak. But he's very interested in how his industry and the general economy are changing and where he and his co-workers will fit in. They get together from time to time when they can, to talk about the good old days, their friends and hobbies. But opportunities for getting together are limited since many are busy looking for work, taking on odd jobs and taking care of business at home.
>
> With encouragement and support from their union local, they have started an electronic discussion group in which stories, jokes, and repartee about the company, union and their future are shared. These discussions are quite informal, personal and comfortable for Bill and others to participate in: there's more interest in *what* people have to say than in how well they say (i.e., write) it. Local volunteers and tutors quietly provide assistance on a confidential basis (no one else in the group knows Bill is receiving help), sometimes through suggestions and question-and-answer exchanges on "the system", sometimes through face-to-face tutoring sessions.

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[26] e.g., Project Tel in New York (Patricia Sachs, personal communication) the New York City Youth Network (Ellen Meier, personal communication, 1991) and La Classe Magica in San Diego (Olga Vasquez, personal communication, 1991).

Teresa, a 20-year-old single mother of two young children, never finished high school and has had limited work experience because she became a parent at a young age and has had to care for her children by herself. Although she is currently on welfare, she is struggling to develop better skills and a more secure life for herself and her children. Using equipment loaned by a local welfare reform program, she has taken an inexpensive computer home and joined an electronic support and discussion group for single mothers. Group members share life stories, experiences, opinions on issues affecting them, tips on childcare, and advice on solving day to day problems. The atmosphere is warm, accepting and supportive.

Struck by some of the very moving life stories of older women who have succeeded in overcoming some barriers she herself faces (and who now are volunteer facilitators and helpers for this statewide group), Teresa has become very interested in learning to express herself in writing and share her experiences and perceptions. She gets suggestions from the facilitators and other participants about interesting books to read (and where to get them from libraries). Teresa is beginning to explore some of the other capabilities of the system and has recently learned that she can get free assistance with her writing from volunteers who are registered on the system as potential helpers.

Tony, a young male inner-city dweller who got into trouble and left school as a teenager, has strong interests in basketball and rap music. Prompted by public service announcements by a basketball star, he went into a local community center that offered public access computers linked to an information system and network of users. A center employee showed him how to use the system and got him started. He accesses the system under a personal pseudonym because he was initially reluctant to expose himself under his real name. He soon found a "rap corner" on the system to which he became a very active contributor, and later branched out into poetry, self-portrait and storytelling activities (especially about basketball). In putting some of his materials together, Tony asks for help in accessing information about basketball players and history and other examples of stories, and eventually learns how to search for and retrieve information from remote sources over the network. Even though his literacy skills were initially below those of many others he interacted with electronically, his high level of interest sustained his engagement and his literacy skills improved dramatically. He eventually became comfortable enough to request confidential help through the system's tutor matching and referral functions.

Paul, a recent immigrant from Eastern Europe, is literate in his native language but has not yet mastered written English. Working from his home in the evenings, he joins a discussion group of Eastern Europeans on the changing political landscape of the world. The discussions take place in English, although some of the more biliterate individuals provide informal help and translation as needed. After a while, Paul learns that there is

another discussion group he's interested in participating in, one that deals with problems facing recent immigrants trying to adapt to life in the United States. This becomes a primary support group for Paul and he becomes a very active participant in the group. Paul's English literacy skills develop progressively in this warm, informal and supportive environment. He learns about adult education opportunities at a local community college (after hearing about the experiences others had trying to enroll, take classes and eventually graduate).

The target population for adult literacy education is comprised of millions of people like Bill, Teresa, Tony and Paul.[27] Literate adults in our society use computers and telecommunications to accomplish tasks like those described above. What does the research literature on literacy development tell us about how such an approach might work for amplifying adult literacy development (and what aspects of it are most essential to its success)? And what are some of the practical concerns in trying to design, implement and operate such programs? The next two sections take these questions up in turn.

THE RESEARCH BASE

Research on literacy development over the last decade suggests a number of critical findings that indicate the strategy suggested in the previous section might advance adult literacy development.

Support Multiple Paths to Literacy Development

Because literacy and schooling have been historically so closely intertwined in the West, their impacts and consequences have often been confounded.[28] One aspect of this confounding is the widespread assumption that literacy is uniquely the outcome of formal instructional activities. Literacy is part of a wide variety of cultural practices, is associated with diverse value systems and beliefs, and helps

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[27] Sticht, op. cit., footnote 9.

[28] Sylvia Scribner and Michael Cole, Literacy Without Schooling: Testing for Intellectual Effects, Harvard Educational Review, vol. 48, no. 4, 1978, pp. 448-461; and The Psychology of Literacy: A Case Study Among the Vai, (Boston: Harvard University Press, 1981).

individuals and groups to accomplish diverse social functions.[29] There are generally *multiple literacies* active in a setting (even where but a single spoken language and script may be in use), which are usually associated with different knowledge bases, patterns of language usage and systems for socializing literate behaviors to children and adults.[30] In one well-known example, distinct patterns of oral and written language usage involved in childrearing practices were found in three rural communities in the southeastern United States.[31] Multiple literacies have been widely reported in urban settings in the United States as well. Adolescents and young adults produce and keep a variety of materials comprising a *vernacular* literacy, including letters, diaries, rap pieces, fight stories, and so forth. These vernacular literacies, associated with peer-based subcultures, contrast dramatically with the literacies associated with the youths' homes and classrooms. Schoolchildren, adolescents and young adults display sophisticated literacy skills and knowledge in such vernacular literacies the likes of which are never displayed in their classrooms.[32]

Such contrasts among distinct literacies suggest the possibility that there may be qualitatively different processes through which individuals develop literacy, some of which may not be associated directly with formal instructional programs. Further evidence of these extra-instructional processes is found in studies of literacy development in young children. These studies identify a rich variety of processes underlying literacy development. Although formally organized instructional activities are often involved, other acquisition processes are at work as well.

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[29] Scribner and Cole, op. cit., footnote 28. Shirley Brice Heath, Ways With Words: Language, Life and Work in Communities and Classrooms, (Cambridge: Cambridge University Press, 1983).

[30] Scribner and Cole, op. cit., footnote 28. Heath, op. cit., footnote 29. Reder and Green, op. cit., footnote 13. Bernard Spolsky, Bilingualism and Biliteracy, The Canadian Modern Language Review, vol. 37, 1981, pp. 475-485.

[31] Heath, op. cit., footnote 29.

[32] Amy Shuman, Storytelling Rights: The Uses of Oral and Written Texts by Urban Adolescents (Cambridge: Cambridge University Press, 1986). Perry Gilmore, Spelling 'Mississippi': Recontextualizing a Literacy-Related Speech Event, Anthropology & Education Quarterly, vol. 14, 1983, pp. 235-255.

Detailed studies of emergent literacy report that young children directly acquire the knowledge, skills and values associated with the specific literacy practices of their home and other early social environments. Recent reviews of research on young children's literacy development model the young child as a "literacy apprentice" whose literacy develops through learning the particular literacy practices of those with whom he or she comes into contact.[33] The fact that some children bring well-developed literacy skills with them when they first come to school reminds us of the impact which extra-school experiences may have on literacy development.[34]

Some researchers have argued that such data indicate literacy (or at least some literacies) may be acquired without participation in formal teaching and learning activities, much as second languages can be acquired without a formal educational program.[35] Although there have been few studies of literacy development specifically among adults, there is evidence that adults *acquire* literacy informally just as young children do.[36] Anecdotal accounts of individuals who have developed sophisticated literacy skills without benefit of much formal education are numerous. An Eskimo bear-hunting guide, for example, who never went to school, prepares and later reviews diary entries and maps from his hunts, draws up

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33 Bambi Scheiffelin and Perry Gilmore (eds.), The Acquisition of Literacy: Ethnographic Perspectives, (Vol XXI in the series Advances in Discourse Processes, Norwood: Ablex, 1986). Heath, op. cit, footnote 29. Patricia Marks Greenfield, "A Theory of the Teacher in the Learning Activities of Everyday Life," In Barbara Rogoff and Jean Lave (eds.), In Everyday Cognition: Its Development in Social Context, (pp. 117-138, Cambridge, MA: Harvard University Press, 1984). William H. Teale, Home Background and Children's Literacy Development. In W. H. Teale and Elizabeth Sulzby (eds.), Emergent Literacy: Writing and Reading, (Norwood: Ablex, 1986).

34 Delores Durkin, Children Who Read Early, New York: Teachers College Press, 1966). Marie M. Clay, Emergent Reading Behavior, Unpublished Ph.D. dissertation, University of Auckland, 1966. Jeanne S. Chall and Catherine Snow, Families and Literacy: The Contributions of Out of School Experiences to Children's Acquisition of Literacy, a final report to the National Institute of Education, 1982. Teale, op. cit., footnote 29. Anne Haas Dyson, Drawing, Talking and Writing: Rethinking Writing Development, (Center for the Study of Writing, Berkeley: University of California, 1989) Bambi Schieffelin and Marilyn Cochran-Smith, Learning to Read Culturally: Literacy Before Schooling. In H. Goelman, A.O. and F. Smith (eds.), Awakening to Literacy, pp. 3-23 (London: Heinemann Educational Books, 1984). Denny Taylor and C. Dorsey-Gaines, Growing Up Literate: Learning From Inner-City Families (Portsmouth: Heinemann, 1988). Robert Gundlach, Marcia Farr and Jenny Cook-Gumperz, Writing and Reading in the Community, In Anne Haas Dyson (ed.), Writing and Reading: Collaboration in the Classroom, (Urbana: National Council of Teachers of English, ERIC Document Reproduction Service No. ED 305 642, 1989).

35 James Gee, Social Linguistics and Literacies, (London: The Falmer Press, 1990).

36 Reder and Green, op. cit., footnote 13.

contracts, keeps records from his business affairs, and writes down traditional stories to help preserve his native culture.[37]

Although there are some indications that certain genres of literacy (e.g., the academic essay) usually require formal instruction,[38] this should not detract our attention from the central importance of these findings: Literacy programs will have broader impact if they support multiple literacies and the multiple ways in which individuals naturally acquire, learn and teach literacy. Programs should be developed which can exploit and/or facilitate natural processes of literacy acquisition.

Engage Learners in Literacy Activities

A growing body of literacy research indicates that one of the best ways to effect literacy development is to *engage* individuals in activities in which writing is used. Engagement in literacy activities appears to drive both informal acquisition as well as formal learning.[39] Programs can engage learners in literacy activities either by building the use of writing into everyday activities in which the learners normally participate, or by drawing learners into new (but engaging) activities in which literacy must be used. Workplace literacy programs which use the settings, materials, language and tasks of a job as an instructional context exemplify the former approach, whereas the discussion and support groups sketched in the preceding section exemplify the latter.

Technology can play a useful role in either of these approaches to building literacy engagement. In terms of the first approach, when new information

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[37] Stephen Reder and Karen Reed Green, Contrasting Patterns of Literacy in an Alaska Fishing Village, International Journal of the Sociology of Language, vol. 42, 1983, pp. 9-39.

[38] David R. Olson, From Utterance to Text: The Bias of Language in Speech and Writing, Harvard Educational Review, vol. 47, pp. 257-281, 1977. Gee, op. cit., footnote 35.

[39] Stephen Reder, Getting the Message Across: Cultural Factors in the Intergenerational Transfer of Cognitive Skills, In Sticht, T., McDonald, B. and Beeler, M. (eds.), The Intergenerational Transfer of Cognitive Skills (Newark, DE: Ablex, in press).

technologies are introduced into everyday tasks (e.g., the ATM machine; the computerized stockroom), they often pose new literacy demands on their users. What may be needed are ways to use the technology to stimulate users' literacy development (perhaps by providing a strategic and possibly invisible mix of task assistance and literacy instruction[40]) rather than just merely posing new environmental demands for it. In terms of the second approach to enhancing literacy engagement, technology may be useful for helping to create interesting and rewarding activity environments, engagement in which may stimulate literacy development. The previously described use of computer-based networks of interesting information and people to interact with, customized to the needs, interests and goals of the individual learner, is a prime example of such an environment. If the process of sharing related information and interacting electronically with other people could be organized in a way that allowed learners to feel safe, secure and supported, then they might well participate in and benefit from these computer-mediated discussions. Using text to communicate with others in this way, individuals could become highly engaged in literacy activities and thereby develop literacy skills and knowledge (especially if informal tutors/peer assistants were available for consultation and assistance.

Remove/Reduce Logistical Barriers to Participation

By removing or at least minimizing barriers to participation--e.g., lack of child care; time and expense to travel to instructional settings; and scheduling conflicts between participants and classes--literacy programs should be able to recruit more participants and retain them longer. Instructional activities which can

[40] There is a range of modes of interaction between knowledge-based computer systems and learners, ranging from so-called "intelligent tutors" to "coaches."

be flexibly scheduled and situated in convenient locations (e.g., private homes, community-based organizations) are preferable for many individuals.[41]

The computer-mediated telecommunication-based activity environments, accessed from participants' homes or other convenient locations, can eliminate or at least minimize many of these barriers. Using personal computers, telephone lines and modems, learners can be connected through file-sharing and message exchange systems with other students, helpers, tutors and instructors. Asynchronously organizing activities, such as those based on electronic mail and bulletin boards, are particularly advantageous. Learners, facilitators and tutors can participate regularly whenever it is convenient, regardless of conflicts among their individual schedules.

Ground Participation in Positively-valued Meanings and Activities

By engaging participants in literacy activities which involve personal and community issues having strong positive meanings and values for them, programs are more likely to experience deeper and longer-lived participation. Findings from both research and practice suggest facilitating literacy development by embedding it in contexts which carry positive meanings for learners.

The concept of *social meaning* has been used to describe the social motivations underlying individuals' preferences for and choices of particular languages in multilingual situations.[42] A growing body of research has extended this concept of social meaning from oral language to literacy.[43] In contexts in which multiple writing systems are in use--such as those described in studies of Navajo-

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41 Gordon G. Darkenwalk, Adult Literacy Education: A Review of the Research and Priorities for Future Inquiry (New York: Literacy Assistance Center, 1986).

42 Joshua A. Fishman, Domains and the Relationship Between Micro and Macrosociolinguistics, In John J. Gumperz and Dell H. Hymes (eds.), Directions in Sociolinguistics, (New York: Holt, Rinehart & Winston, 1972).

43 Michael Stubbs, Language and Literacy: The Sociolinguistics of Reading and Writing, (London: Routledge & Kegan Paul, 1980). Bernard Spolsky, Bilingualism and Biliteracy, The Canadian Modern Language Review, vol. 37, 1981, pp. 475-485. John Szwed, The Ethnography of Literacy, In Marcia F. Whiteman (ed.), Variation in Writing: Functional and Linguistic-Cultural Differences, (Hillsdale: Erlbaum, 1981). Fishman, op. cit., footnote 42. Reder and Green, op. cit., footnote 37.

English biliteracy on an Indian reservation in the Southwest[44] or in a comparative study of biliteracies among ethnic minority communities[45]--clear patterns of social meanings link literacy to ethnic and cultural identities. Social meanings may also be associated with changing life circumstances. We need only think of the image of the two immigrant brothers--one nostalgically reading the native language newspaper from the "old country" while the other eagerly reads the English language newspaper from his newly adopted country--to appreciate the depth and richness of these contrasting social meanings.

Social meanings for literacy are also generated by communicative choices to use *writing* in particular contexts rather than other forms of communication. In a study of literacy in an Eskimo village, for example, choices and alternations between use of writing and oral communication in various activities carried specific social meanings for the villagers regardless of the language involved. In some contexts, the use of writing carried positive social meanings ("village"), whereas in other contexts it carried negative meanings ("outside").[46]

Social meanings for literacy practices frequently come from the larger societal or institutional contexts in which they are imbedded. Comparative studies of literacy across societies confirms its tendency to be constitutive of a society's power structure.[47] In contexts in which literacy activities entail participation in that power structure, literacy and non-literacy tend to carry the strong social meanings associated with access and non-access to the power structure and its economic and cultural resources. There have been other approaches to the analysis of social

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[44] Spolsky, op. cit., footnote 43.

[45] Stephen Reder, Comparative Aspects of Functional Literacy Development: Three Ethnic American Communities. In Daniel Wagner (ed.), The Future of Literacy in a Changing World (Oxford: Pergamon, 1987).

[46] Reder and Green, op. cit., footnote 37.

[47] Jack Goody, Literacy in Traditional Societies, (London: Cambridge University Press, 1968) and The Interface Between the Written and the Oral, (Cambridge, MA: Cambridge University Press, 1987). Brian V. Street, Literacy in Theory and Practice, (Cambridge, MA: Cambridge University Press, 1984).

meanings as well. Some have argued that literacy practices are constitutive of particular sociohistorically developed *discourses*[48] or *voices*[49] whose utilization by individuals entails specific social meanings.

These social meanings influence individuals' participation in literacy practices and ultimately their acquisition of the literacies constituted by those practices. In domains where positive social meanings are associated with literacy, literacy thrives and socializes effectively throughout the population. In domains characterized by negative social meanings, the opposite too often prevails.[50] A key to effective literacy development, regardless of the technologies or pedagogies involved, is to work in circumstances in which literacy carries positive social meanings for the participants and learners.[51]

The transformational power of positive social meanings has been harnessed in adult literacy education. One of the best known examples comes from the work of Paulo Freire in South America. Freire developed literacy programs for rural adults, innovating a pedagogy which associated becoming literate with the social meanings of political enfranchisement, empowerment and the ability to transform one's life ("critical consciousness").[52] Others have enthusiastically tried to adapt his philosophy and pedagogy for use elsewhere, including some attempts in the United States.[53] One factor that has limited the applicability of Freire's approach to adult education in the United States is the diversity of goals, values and meanings which adults associate with literacy. Program designs which permit grouping and

[48] James Gee, Orality and Literacy, TESOL Quarterly, vol. 20, pp. 719-746, 1987 and What is Literacy?, (Newton, MA: Educational Development Center, 1989) and Gee, op. cit., footnote 35.

[49] M. M. Bakhtin, The Dialogic Imagination (Austin: University of Texas Press, 1986).

[50] Reder, op. cit., footnote 45. Reder, op. cit., footnote 39.

[51] Reder and Green, op. cit., footnote 13.

[52] Paulo Freire, The Adult Literacy Process as Cultural Action for Freedom, Harvard Educational Review, vol. 40, no. 2, May 1964.

[53] Fingeret and Jurmo, op. cit., footnote 17.

interaction of learners who share particular goals, attitudes and positive meanings (whatever they might be) for literacy have a broader inventory of instructional techniques and approaches to work with, including those of Freire. In the Cook County (Illinois) Juvenile Detention Center, for example, in which numerous adolescent gang members are incarcerated, it was possible to implement a literacy program that empowers the voice and perspective of that particular peer-based subculture. By legitimizing their discourse, world outlook and concerns, the program has been able to reach and serve individuals that have been bypassed by numerous other educational approaches.[54] The uses of technology suggested here may make such approaches more attainable for many adult literacy learners and programs by linking together over space and time individuals who share particular meanings and goals which literacy activities can appropriate.

Address Concerns of Anonymity and Face

The popular metaphors of illiteracy in the United States paint a negative, stigmatized image of the adult who cannot read well. We have "campaigns" to "wipe out" or "eradicate" illiteracy, as if it were a disease like smallpox. Seemingly endless public announcements remind us that illiteracy is closely related to such social problems as welfare dependency, crime and unemployment. Parents are reminded that their children may fail in school if they do not read to them. Our deteriorating international economic position is frequently blamed on the illiteracy of the workforce.

It should come as no surprise, then, that many adults with marginal literacy skills do not wish to come forward to identify (and thus stigmatize) themselves as needing better literacy skills. There are countless anecdotes of workers who "get by"

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[54] Reder and Green, op. cit., footnote 13. Arlene Fingeret, Social Network: A New Perspective on Independence and Illiterate Adults, Adult Education Quarterly, vol. 33, no. 3, 1983, pp. 133-146.

on the job by "faking it", by secretly relying on a friend's or wife's or colleague's literacy skills to help them read the material, fill out the forms, and so forth.[55] Such stigmatization, of course, sometimes leads to legitimate concerns about how others might respond, e.g., that jobs will be lost (often creating an unattractive climate for introducing workplace literacy programs).[56] Individuals' self-esteem may be on the line as well. Many if not most participants in adult literacy programs report negative and painful prior experiences with schooling; their literacy difficulties are intimately associated with those past experiences of school failure, public acknowledgement of which may be so painful as to prevent their expressing interest or participating in literacy programs.[57] Even those who are willing to participate may do so only if their participation remains confidential from friends, co-workers and others.

As an example, consider a large manufacturing plant I have observed, at which a workplace literacy program was organized to assist workers to develop basic skills needed to use the new automated statistical process control system being introduced. Although the program had features to encourage participation (e.g., voluntary participation, on-site location, full compensation "on the clock" for participating), initial recruitment efforts were not very successful. It was not until procedures were put into place to assure *confidentiality* of participation that recruitment succeeded. Workers reported that they did not want their co-workers and supervisors to know that they were participating.

Allowing adults to participate *remotely* in literacy activities (e.g., electronic discussion groups, tutoring activities) through technology may provide a critical sense of privacy and/or anonymity for their literacy development. For some

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[55] Dee Oglesby, Untitled paper presented at National Center on Adult Literacy Roundtable on Literacy and Cultural Diversity. University of California, Santa Barbara, June 1991.

[56] Anthony Sarmiento and Ann Kay, Worker-Centered Learning: A Union Guide to Workplace Literacy, (Washington, DC: AFL-CIO Human Resources Development Institute).

[57] Fingeret, op. cit., footnote 9. Beder, op. cit., footnote 14. Reder, et al, op. cit., footnote 41.

individuals, use of first names only or pseudonyms (like CB "handles") can provide anonymity while allowing them to have electronic "identities" through which they can interact with others and participate in personally meaningful discussions and activities. As relationships, trust and a sense of safety develop, personal information and identities can be progressively revealed (if desired). This approach has worked quite well in a variety of remote electronic networks, in which sensitive or very personal topics and information can be shared and discussed in confidence and safety, while maintaining users' personal identities and ties to their own contributions.[58]

Use Technology as a Bridge: Interactive Text

Literacy often involves relatively decontextualized, abstract and impersonal uses of language, something many researchers believe makes use of written language difficult to learn.[59] If this is the case, then learning environments which bridge between the relatively unfamiliar characteristics of written language and the more familiar and comfortable characteristics of face-to-face conversation may facilitate literacy development. Computer-mediated communication (CMC) over electronic networks, in which messages are exchanged as electronic mail or as real-time text displays, often takes on language characteristics that are intermediate between those of face-to-face (or telephone) conversation and those of normal written messages.[60] Comparisons of communicative features of different channels in workplace communication reveals a similar pattern, with electronic mail being

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[58] Meier, op. cit., footnote 26.

[59] Olson, op. cit., footnote 38. Jack Goody and Ian Watt, The Consequences of Literacy, Comparative Studies in Society and History, vol. 5, pp. 27-68, 1963.

[60] Joy Kreeft Peyton and JoAnn Mackinson-Smyth, Writing and Talking About Writing: Computer Networking With Elementary Students. In Donna M. Johnson and Duane H. Roen (eds.) Richness in Writing: Empowering ESL Students (New York: Longman, 1989).

intermediate between face-to-face and written communication.[61] Comparisons of consultative (i.e., problem-solving) communication through oral conversation, electronic mail and hardcopy materials yield a similar continuum of language characteristics, with CMC again being an intermediate (or "bridging") form between oral and written communications.[62] In these studies, it is the relative degree of informality and quick response time in exchanging textual messages that is believed to lend CMC its bridging capabilities between the formal and informal.

Other factors may be operating as well. One recent review of research comparing CMC to face-to-face communication concluded that the relative lack of social context or "presence" experienced in CMC makes users less reluctant to speak up and to reveal personal information about themselves. Organizations using CMC thus discovered, quite to everyone's surprise, that individuals were often much more willing to participate in privacy-sensitive activities such as counseling.[63] Here again, we can see the potential of this medium for literacy development: Individuals may be much more willing to present themselves as being marginally skilled in this area and in need of counseling/assistance.

The aforementioned review concludes that CMC's chief advantage is its ability to spread *informal* communication over discontinuities in space and time, particularly for individuals who are relatively socially isolated from those they might otherwise communicate with.[64] The strategy suggested here thus creates another bridging role for technology in adult literacy development: It tends to associate literacy (use of text) with the more comfortable informal genres of communication

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[61] Stephen Reder and Robert G. Schwab, The Communicative Economy of the Workgroup: Multi-Channel Genres of Communication, Office: Technology and People, vol. 4, pp. 177-195, 1989.

[62] Sproull and Kiesler, op. cit., footnote 24.

[63] Sproull and Kiesler, op. cit., footnote 24.

[64] Sproull and Kiesler, op. cit., footnote 24.

and with the expansion of one's social world. This could situate literacy development in vibrant *learning communities*, a topic considered further below.

Use Technology as a Bridge: Personalize Academic Activities

One well-known way of classifying communicative activities uses a two dimensional scheme which places activities on an *interactive* vs. *monologic* dimension and on an *academic* vs. *personal* dimension. Examples of the various combinations include: informal discussions (personal & interactive); discussions of news or books (academic & interactive); personal letters (personal & monologic); essays (academic & monologic).[65] As noted above, use of CMC tends to make written activities (literacy) more interactive. Some recent studies of the influence of CMC on the development of students' writing abilities indicates that CMC allows academic tasks to be learned and accomplished in more personal and interactive contexts.[66] For many individuals, this makes the learning process easier and more enjoyable. For adult literacy learners (who have not been studied in these terms yet), CMC may be expected to facilitate development for the same reasons: The technology bridges between the unfamiliar/difficult targets of learning (the academic and monologic tasks) and the familiar activities that learners already do and know (the personal and interactive).

Establish Continuities Between Helping and Tutoring

In children's literacy development there is an intricate relationship among the helping, teaching and learning that takes place in cooperative activities. Learning resembles an apprenticeship setting. In the cooperation of parent and

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[65] J. Cummins, The Role of Primary Language Development in Promoting Educational Success for Language Minority Students. In Schooling and Language minority Students: A Theoretical Framework (Los Angeles, CA: California State University, 1981).

[66] Peyton and Mackinson-Smith, op. cit., footnote 60. Bertram Bruce and Joy Kreeft Peyton, A New Writing Environment and an Old Culture: A Situated Evaluation of Computer Networking to Teach Writing, Interactive Learning Environments, vol. 1, no. 3, pp 171-191, 1991.

child, for example, in reading stories, development is organized as a series of divisions of labor between parent and child rather than as a progression through a fixed hierarchy of skills.[67] Rather than presenting the learner with a series of progressively more complex tasks to perform (eventually approximating the target task), the apprenticeship-like approach maintains a constant task that is approached through a series of divisions of labor, in which the learner takes on progressively more difficult roles in the collaborative accomplishment of the task.[68]

From this point of view, adult literacy development would be seen as a sequence of divisions of labor between learners and their tutors or others with whom they collaborate to accomplish meaningful and engaging literacy tasks. This is the essence of *giving literacy away*, a strategy for embedding instruction within naturally occurring patterns of assistance.[69] In terms of giving away literacy, technology is seen as mediating or facilitating the evolving relationship between the learner and the tutor/teacher rather than replacing it. Whereas cognitive science/artificial intelligence approaches tend to apply technology to interactions between learners and machines (replacing the teacher), the approach considered here sees the technology as facilitating the learner's interaction with others in the social world.[70] Although the former approach certainly has its place in adult literacy learning (it is certainly the dominant approach to using technology thus far), the strategy of using technology to exploit the potential of cooperative literacy activities as learning environments also needs to be systematically explored and developed.

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67 Shirley Brice Heath, What No Bedtime Story Means: Narrative Skills at Home and School, Language in Society, vol. 11, 1982, pp. 49-76. Newman, et al, op. cit., footnote 23.

68 Patricia Marks Greenfield, A Theory of the Teacher in the Learning Activities of Everyday Life. In Barbara Rogoff and Jean Lave (eds.) Every Cognition: Its Development in Social Context (Cambridge, MA: Harvard University Press, 1984).

69 Reder and Green, op. cit., footnote 13.

70 Newman, et al, op. cit., footnote 23. Catherine Emihovich, Technocentrism Revisited: Computer Literacy as Cultural Capital, Theory Into Practice, vol. XXIX, no. 4, Autumn 1990, pp. 227-234.

Build Learning Communities

In recent years computers have been used in schools to create various types of specialized learning environments. Some have been termed *functional learning environments,*[71] *on-line learning communities,*[72] *or virtual classrooms.*[73]. Although the details of such conceptions differ, they share an important characteristic in using the communication and information-sharing capabilities of connected computers to great educational advantage.[74] In examining the use of such techniques to create "vibrant learning environments", five clusters of issues which impact the effectiveness of existing technology-based learning communities have been identified: (1) the functioning/ease-of-use of the technology; (2) issues related to the formation of the community; (3) the discourse forms utilized; (4) the definition of the (functional learning) activity; and (5) quality control factors.[75]

If such concerns are addressed, can such learning environments be created for adults with low literacy skills? Many of the logistical barriers to sustained participation in programs could easily be overcome if vibrant on-line communities could be established among adult learners, helpers, tutors, and teachers (based on positive social meanings, interests and compatibility of goals). Access to and ease of use of telecommunications equipment would be major issues for this population. The cost of adding this capability to households continues to drop dramatically. Easy-to-use software for off-line reading and composing of messages with automatic uploading and downloading of messages and requested information is now routinely available. Help systems--computer-based and human-based--would have to be well

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71 Dennis Newman, Functional Environments for Microcomputers in Education, In Roy D. Pea and Karen Sheingold (eds.), Mirrors of Minds: Patterns of Experience in Educational Computing (Norwood, NJ: Ablex, 1987).

72 Hawkins, op. cit., footnote 23.

73 Starr Roxanne Hiltz, Collaborative Learning in a Virtual Classroom: Highlights of Findings, Proceedings of the Conference on Computer-Supported Cooperative Work, pp. 282-290, 1988.

74 Vivian M. Horner and Linda G. Roberts (special editors), The Annals of the American Society of Political and Social Science, vol. 514, March 1991.

75 Hawkins, op. cit. footnote 23.

integrated into the design of the overall literacy program and telecommunications system. Standards might have to be established for discourse forms, although there is little reason to suppose that would be a major issue given the appropriate division of users into on-line subcommunities (in terms of personal voice, interests, goals, literacy skills, etc.). These are issues taken up in the final section of this report.

IMPLEMENTATION ISSUES

A number of important design and implementation issues arise in following the approach suggested here. Several of these are mentioned briefly in this section along with some ideas for addressing them.

Ample Equipment and Access

It is essential, if this enterprise is to succeed on a large scale, that individuals have ready access to personal computer (PC) equipment with modems and appropriate software. Only low-end hardware is needed, since the primary operations will be the creation and reading of plain text messages. Storage and forwarding of messages will be handled by central systems to which the learner's computers will connect. To minimize telecommunications costs and contention for central system resources, most messages will be read and/or created off-line (i.e., when the learner's computer is not connected to the central system).

Although it would be desirable, everything else being equal, to have more capabilities at the PC end (e.g., graphics, hard disk, storage, bit-mapped interface), the primary goal needs to be getting *basic* capabilities into the hands of as many potential adult learners as possible. To the extent that limited resources create tradeoffs between getting less expensive systems into the hands of more learners versus getting more expensive systems into the hands of fewer learners, choose the

lower end with broader participation. Adult literacy development is about democratizing access to intellectual and cultural resources.

It has sometimes been suggested that the priority in using technology to address adult literacy problems be placed on creating "high technology information highways" linking America's homes, schools and work places.[76] Although there are many advantages in using these more powerful technologies, it must be remembered that much of what appears today as our "adult literacy problem" is the result of inequitable access to the original information highways of our society, namely print. There may be other reasons to invest in high-end computer and telecommunications technology,[77] but improving adult literacy is not necessarily one of them.

Great ingenuity needs to be applied to arrange technology access for the millions of adult learners who might potentially participate. For many, equipment loans or grants to use equipment in the home may be a feasible approach. Although there are already nearly 30 million PCs in America's households,[78] most of these are probably in relatively affluent and educated households rather than in those of the target population. With hardware prices for low-end equipment dropping dramatically and increases in the supply of excess business equipment (especially low-end hardware that cannot run the newer software but has the functionality needed here), a wide variety of strategies can be developed to get equipment into the hands of learners.

To consider an example, the rapid conversion of business PCs to 32-bit technology is creating a booming market for excess PCs, many of which are appropriate for use in adult learning activities. There are now national brokerages

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[76] U.S. Congress, Office of Technology Assessment, informal discussion in a seminar on Adult Literacy and Technology held at the U.S. Congress, September 26-27, 1991.

[77] Mitchell Kapor, NREN and the Public Computer Network, unpublished manuscript, 1991.

[78] Electronics Industries Association, Consumer Electronics U.S. Sales, January 1992.

for the resale of such used PC equipment.[79] Sales of used PC equipment through these channels exceeded $2 billion in 1990, and are projected to grow at an annual rate of 30-40 percent. One company even refurbishes such equipment before resale, cleaning the keyboard and repainting the box. Through such channels, it is possible to get used equipment at a fraction of the new cost. Or, given the rapidly dropping prices involved, persuade corporations to become partners in adult literacy by donating equipment for that purpose. Another interesting possibility would be to incorporate community-based training and job creation programs for technicians to refurbish, install, and maintain PCs used in adult literacy programs.

Technical Support for Equipment Installation and Use

Regardless of where learners use the equipment, technical support will be needed to set it up, demonstrate its uses and maintain it. Linking equipment into the telephone system through modems is a particular area of concern, one in which computer users regularly need extra assistance. Community-based organizations, literacy volunteers, college work-study students, computer technician training programs and other groups could participate in providing some of these services. Demonstration video tapes, 800 hot lines, and well-designed, easy-to-use special purposes software can also help.

Software Design and Tools

Turnkey, user friendly software needs to be developed and then inexpensively disseminated for use with projects based on this approach. The interface needs to be simple, special purpose, and easy for the target population to use. The technical assistants (see above) would initially enter the modem

[79] Examples of such brokerages are those provided by Boston Computer Exchange, Vision Investment and EXSEL.

configuration and local access telephone number into the software, after which it operates in a turnkey, menu-driven fashion.

The program is usually operated in an off-line mode in which messages are created for subsequent uploading, previously downloaded messages are read and responded to. Searches and needed information, interesting individuals and discussion groups, assistance and tutor referrals can be requested by menu. Once messages and requests are ready, a single command initiates a brief automated call to the central system to upload information and download other waiting information.

The software should have basic text editing capabilities built in with which each learner can read and compose messages. Its design should be such that documents created by an external word processing program can easily be incorporated into the system. This will eventually allow learners to use more sophisticated tools and software as their interests and abilities permit.

The software on the central system should support various techniques of message storage and forwarding operations, including electronic mail, bulletin boards, computer conferencing, and so forth. There should be easy-to-use and efficient referral capabilities for finding and contacting compatible learners, tutors, facilitators, community resources and educational opportunities.

Teaching and Learning Support

Tutors and teachers will be important members of these on-line learning communities. They will need specialized tools and software to participate and support the learners. In addition to the contact and referral services previously mentioned, tutor and teacher participants may need help managing information and materials they keep about individual learners, querying experts for suggestions about problems participating learners are encountering, and so forth.

In addition to the roles of tutors and teachers, on-line discussion groups generally need *facilitators*.[80] These are individuals particularly adept at making sure that electronic conversations progress smoothly, and that the environment remains warm, informal and supportive. It is essential to include such individuals, selected more for their rapport with and trust by other participants than for their technological expertise.

It may well be possible and desirable to build in "intelligent" computer-based instruction, coaching and other techniques. Nothing that has been said here should be taken to imply a lack of interest in such computer applications. They can and perhaps should be carefully incorporated into the final, on-line learning communities, but not at the expense of reducing access and participation by consuming precious resources. The critical factor in the present approach is to use the technology to mediate rather than replace the evolving social relationships among learners, tutors and teachers in the learning communities.

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[80] Peter and Trudy Johnson-Lenz, Islands of Safety for Unlocking Human Potential, Proceedings of Third International Guelph Symposium on Unlocking Human Potential via Computer Mediated Communication (Guelph, Ontario: University of Guelph, 1990).